

## QUALITY OF LIFE OF DIABETIC FOOT ULCER PATIENTS WITH HYPERBARIC OXYGEN THERAPY

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### ABSTRACT

*DM with ulcer can result in a decrease in the quality of life of patients and need to reduce the intensity of pain and odor on the ulcer, preventing amputation and Hyperbaric Oxygen as an adjuvant therapy in accelerating wound healing. This study aims to explain the effect of HBO on the quality of life of patients with diabetic foot ulcers at RSAL Dr. Ramelan Surabaya. Methods: The research used quasi-experimental design with a non-equivalent control group design approach. The samples were 70 patients from population of all diabetes patients who suffered from diabetic foot ulcers at RSAL Dr. Ramelan. Data were collected by WHOQOL-BREF questionnaire. Analyzed by Wilcoxon signed rank test and Mann Whitney U test. Result: Mann Whitney in the post test, the physical p-value domain (0.000), psychological domain (0.012), social domain (0.003), and environmental domain (0.001), where the intervention group has a better value than the control group. Wilcoxon signed rank test results on the physical domain (0.000), psychological (0.012), social (0.003), and environmental (0.001), meaning there were significant differences between pre post test in intervention group. Discussion: Diabetes mellitus patients with foot ulcers given hyperbaric oxygen showed improvement on wound condition, thus reducing pain and medical needs. This makes patients motivated, reduce anxiety, and improve interpersonal support and confidence. Therefore, it is necessary to socialize the effect of HBO on DM patients with foot ulcer, as a treatment option in improving the quality of life of DM patients with foot ulcers.*

**Keywords:** Diabetic foot ulcer, hyperbaric oxygen, quality of life

### ABSTRAK

*Diabetes Melitus (DM) dengan ulkus dapat menurunkan kualitas hidup dan perlu untuk mengurangi intensitas rasa sakit dan bau, mencegah terjadinya amputasi sehingga diperlukan Hiperbarik Oksigen (HBO) sebagai terapi adjuvant dalam mempercepat penyembuhan luka. Penelitian ini bertujuan untuk menjelaskan efek HBO terhadap kualitas hidup pasien dengan ulkus kaki diabetik di RSAL Dr. Ramelan Surabaya. Metode: Penelitian ini menggunakan desain quasi eksperimental dengan pendekatan non-equivalanet Control Group Design. Sampel sebanyak 70 pasien. Data dikumpulkan dengan kuesioner WHOQOL-BREF dan dianalisis menggunakan Wilcoxon Signed Rank Test dan Mann Whitney U test. Hasil: Mann Whitney U test pada domain fisik ( $p=0,000$ ), psikologis ( $p=0,012$ ), sosial ( $p=0,003$ ), dan lingkungan ( $p=0,001$ ), menunjukkan kelompok intervensi memiliki nilai yang lebih baik daripada kelompok kontrol Wilcoxon Signed Rank Test pada domain fisik ( $p=0,000$ ), psikologis ( $p=0,012$ ), sosial ( $p=0,003$ ), dan lingkungan ( $p=0,001$ ), yang berarti ada perbedaan yang signifikan antara pre post-test pada kelompok intervensi. Diskusi: Pasien diabetes mellitus dengan ulkus kaki yang diberi HBO menunjukkan perbaikan pada luka, sehingga mengurangi rasa sakit dan kebutuhan medis. Ini membuat pasien termotivasi, mengurangi kecemasan, dan meningkatkan dukungan interpersonal dan kepercayaan diri. Oleh karena itu, perlu disosialisasikan efek HBO pada pasien DM dengan ulkus kaki, sebagai pilihan pengobatan dalam meningkatkan kualitas hidup pasien DM dengan ulkus kaki.*

**Kata kunci:** Ulkus kaki diabetik; oksigen hiperbarik; kualitas hidup

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## INTRODUCTION

Diabetes mellitus (DM) become a phenomenon at the global level especially in developing countries such as Indonesia, morbidity and mortality due to diabetes mellitus which is still high. In Indonesia, diabetes

mellitus became one of the diseases with the highest cost burden of medical services after heart disease and stroke (Kemenkes, 2014). Diabetic foot ulcer is the most dreaded chronic complication for patients with DM, both in terms of long time care as well as the high cost of required (Awad, Langi and Pandelaki, 2013). The

process of healing and treatment that is long enough to make the incidence of negative feelings such as feelings of abandonment and despair (Firman et al 2012).

Diabetes with ulcer is a chronic disease so that required constant management to avoid complications which may result in a decrease in the quality of life of patients (Hasanat & Ningrum 2010). Research conducted by Roni (2016) with the result that diabetic patients who experience diabetic foot ulcer in RSUD Arifin Achmad Pekanbaru has low levels of quality of life. Decreased quality of life in patients with diabetic foot ulcers is associated with limitations in activity, disability, and ulcer pain (Ribu & Wahl 2004). The study conducted by Meijer et al (2001) also reported that the health quality of life of diabetes mellitus patients with foot ulcer is lower than diabetes patients without ulcer. In addition to physical factors, patients who experience a foot ulcer diabetic reported their quality of life is also influenced by psychosocial factors. The psychosocial issues include the existence of restrictions interact and isolation of his social life (Kinmond et al 2003).

Hyperbaric oxygen (HBO) is one of adjuvant therapy in the treatment of diabetic foot ulcers (Neal 2002) by administering 100% oxygen where the patient is in a high-pressure room and breathes with pure oxygen at greater air pressure than normal atmospheric air that is 1 ATA (Absolute Atmosphere). The role of hyperbaric oxygen is to improve the amount of oxygen delivered to the wound area, either bound to haemoglobin or dissolved in the plasma. Thus, the rate of wound healing is directly related to the levels of oxygen in the tissues (Carls et al 2013).

Efforts that can be made to overcome changes in quality of life such as reducing the intensity of pain and odor on the ulcer so that patients with diabetic foot ulcers have the same opportunity to move and socialize with the environment, prevent amputations in diabetic foot ulcers with proper wound care management and hyperbaric oxygen as an adjuvant therapy in accelerating wound healing.

## **MATERIALS AND METHODS**

### **Design**

This was an experimental quantitative study. The research method used in this study was a quasy experimental design with a non-equivalent control group design approach.

### **Population and sample**

The population in this research were all diabetes mellitus patients who had foot ulcers at RSAL Dr. Ramelan. The number of samples in the study were 70 people, 35 people as a control group and 35 people in the intervention group were taken using purposive sampling technique.

### **Instrument**

This study used the WHOQOL-BREF (WHO 2004) quality of life questionnaire which produced a quality of life profile based on 26 questions divided into 4 domains of quality of life. The domains are physical domain, psychological domain, social relationships domain and environmental domain in which the values indicate individual perceptions about their quality of life. The value of the domain is positive (1-5). The higher the value obtained shows the better quality of life.

### **Procedure**

Researchers identified diabetic patients with diabetic foot ulcer that meet the criteria. After respondents is selected, then the researcher is asked to fill out informed consent. The initial data collected was an assessment of quality of life, both in the control group and intervention group by distributing questionnaires to be filled independently by respondents at the initial meeting (pre-test). Then followed the hyperbaric oxygen schedule in the intervention group. The intervention given was HBO 2.4 ATA therapy with 100% O<sub>2</sub> for 3x30 minutes 20 times over the past 20 days, whereas in the control group was given only diabetic foot ulcer treatments on a regular basis without given hyperbaric oxygen. After 20 days, quality of life was assessed by resharing the questionnaire to be filled out by respondents in the two groups which will then be analyzed for quality of life tests in the unpaired group before and after the intervention.

### **Ethical research**

The implementation of all research activities was very concerned about scientific attitude and using ethical principles in nursing research. The research was conducted after obtaining an ethical test certificate from the RSAL Ethics Committee Dr. Ramelan Surabaya with letter number B/ND-419/XII/2018

### **Analysis**

The analysis technique used for bivariate analysis was the Wilcoxon signed rank test to determine changes in the quality of life in the control and intervention groups.

While to determine the effect of HBO on the quality of life of patients with ulcers used Mann Whitney U Test.

Table 1 shows the distribution of the gender of the majority of respondents as many as 21 people (60.0%) in the control group and 19 people (54.3%) in the intervention group. Distribution according to the age of the majority of respondents in the early elderly were 37 people (52.9%), the rest were in late adulthood and the elderly. Distribution of respondents based on education level found that the majority of respondents had middle education as many as 32 people (45.7%).

Table 1 also shows the distribution of occupation most of respondents working as employees as many as 27 people (38.5%). That number is nearly equal to the respondents who are not working as many as 25 people (35.7%) consisted of housewives and retiree. In terms of income, the majority of income in accordance with the UMR is 30 people (42.9%) because even though it does not work, retiree respondents still get pension funds from the government. Based on table 1, it can be seen that the majority of respondents had suffered DM> 5 years as many as 57 people (81.4%) with the most complications of diabetic foot ulcers at degree 4 Wagner, 38 people (54.3%).

## RESULTS

Table 1. Distribution of control group respondents and interventions based on the characteristics of ulcers patients at RSAL Dr. Ramelan Surabaya in November-December 2018

Characteristics	Control		Intervention		Total	
	n	%	n	%	n	%
Gender						
Male	21	60	19	54.3	40	57.1
Female	14	40	16	45.7	30	42.9
Total	35	100	35	100	70	100
Age Range						
Late Adulthood (36-45 year)	3	8.6	2	5.7	5	7.1
Early Elderly (46-55 year)	15	42.9	22	62.9	37	52.9
Elderly (56-65 year)	17	48.6	11	31.4	28	40
Total	35	100	35	100	70	100
Education						
Elementary (Elementary-Junior High School)	16	45.7	4	11.4	20	28.6
Middle (High School)	13	37.1	19	54.3	32	45.7
High (College)	6	17.1	12	34.3	18	25.7
Total	35	100	35	100	70	100
Occupation						
Retiree	5	14.8	6	17.1	11	15.7
TNI/POLRI/PNS	4	11.4	6	17.1	10	14.3
Entrepreneur	1	2.9	7	20.0	8	11.4
Employee	19	54.3	8	22.9	27	38.6
Housewife	6	17.1	8	22.9	14	20
Total	35	100	35	100	70	100
Income						
< UMR	17	48.6	7	18.5	24	34.2
UMR	13	37.1	17	51.9	30	42.9
> UMR	5	14.3	11	29.6	16	22.9
Total	35	100	35	100	70	100
Length of DM						
≤ 5 year	8	22.9	5	14.3	13	18.6
> 5 year	27	77.1	30	85.7	57	81.4
Total	35	100	35	100	70	100
Ulcers Degree						
Wagner 3	15	42.6	17	48.6	32	45.6
Wagner 4	20	57.1	18	51.4	38	54.3
Total	35	100	35	100	70	100

Table 2. Range of quality of life domain values before and after HBO therapy in ulcer patients at RSAL Dr. Ramelan Surabaya in November-December 2018

Variables	Control Group				Intervention Group			
	Pre		Post		Pre		Post	
	n	%	n	%	n	%	n	%
PhysicalDomain								
High	0	0	0	0	0	0	5	14.3
Middle	2	5.7	8	22.9	0	0	12	34.3
Low	33	94.3	27	77.1	35	100	18	14.3
Total	35	100	35	100	35	100	35	100
Wilcoxon Signed Rank Test	p=0.05				p=0.00			
Mann Whitney U Test	p=0.013							
Psychological Domain								
High	0	0	0	0	0	0	1	2.9
Middle	1	2.9	4	11.4	2	5.7	10	28.6
Low	34	97.1	31	88.6	33	94.3	24	68.6
Total	35	100	35	100	35	100	35	100
Wilcoxon Signed Rank Test	p=0.083				p=0.012			
Mann Whitney U Test	p=0.040							
Social Domain								
High	0	0	1	2.9	0	0	5	14.3
Middle	6	17.1	9	25.7	10	28.6	14	40
Low	29	82.9	25	71.4	25	71.4	16	45.7
Total	35	100	35	100	35	100	35	100
Wilcoxon Signed Rank Test	p=0.123				p=0.003			
Mann Whitney U Test	p=0.020							
Environment Domain								
High	0	0	0	0	1	2.9	2	5.7
Middle	1	2.9	4	11.4	6	17.1	16	45.7
Low	34	97.1	31	88.6	28	80	17	48.6
Total	35	100	35	100	35	100	35	100
Wilcoxon Signed Rank Test	p=0.083				p=0.001			
Mann Whitney U Test	p=0.000							

Table 2 shows that in the physical health domain the post-test score of the intervention group was higher than the control group, where 12 people (34.3%) getting a mid-score, there were even 5 people (14.3%) getting high scores. The Wilcoxon signed rank test statistical test results found an increase in the value of the intervention group obtained a value of  $p = 0,000$  means that there are significant differences between the physical health domain before and after hyperbaric oxygen. On the results of the Mann Whitney U Test statistic on the physical health domain, after being given hyperbaric oxygen the results showed that there were significant differences between the control group and the intervention with a value of  $p = 0.013$ .

The results of the psychological domain post-test value based on table 2 indicate a difference between the control and intervention groups. When compared, the control group had a lower post-test value than the

intervention group. In the intervention group there were only 24 people (68.6%) with low scores, 10 people (28.6%) got mid scores, and 1 person (2.9%) got high scores. The Wilcoxon signed rank test statistical test results found an increase in psychological domain values in the intervention group,  $p = 0.012$ , meaning that there were significant differences between the psychological domains before and after HBO. The results of the Mann Whitney U Test statistical test on the psychological domain, after being given hyperbaric oxygen, showed that there was a significant difference between the control group and the intervention with a value of  $p = 0.040$ .

Based on table 2, it can be seen that the post test results of the intervention group are higher than the control group, there are 16 people (45.7%) with low scores, 14 people (40%) get mid scores, even 5 people (14.3%) get high scores. Unlike the case in the control group, where

there are still 25 people (71.4%) with low scores. The Wilcoxon signed rank test statistical test results found an increase in the value of the domain of social relations in the intervention group, the value of  $p = 0.003$  means that there are significant differences between the social relations domain before and after hyperbaric oxygen. On the results of the Mann Whitney U Test statistic on the social relations domain, after being given hyperbaric oxygen the results showed that there was a significant difference between the control group and the intervention with a value of  $p = 0.020$ .

In the environmental domain based on table 2, the post-test value of the environmental domain in the intervention group is higher than the control group. Where there are 17 people (48.6%) with low scores, 16 people (45.7%) of whom get mid scores, and 2 people (5.7%) with high scores. The Wilcoxon signed rank test statistical test results found an increase in the domain value of social relations in the intervention group, obtained  $p$  value = 0.001 means that there are significant differences between the environmental domain before and after hyperbaric oxygen. On the results of the Mann Whitney U Test statistic on the social relations domain, after being given hyperbaric oxygen the results showed that there were significant differences between the control and intervention groups with a value of  $p = 0,000$ .

## DISCUSSION

The results of this research show that there is influence of hyperbaric oxygen on physical health domains of quality of life. The test results of the Mann Whitney U Test showed a significant difference between the groups who received hyperbaric oxygen with the control group. It is supported by the results of a test of Wilcoxon signed rank test stating, there is a significant difference between pre and post-test intervention group.

The main role of hyperbaric oxygen is to improve the amount of oxygen delivered to the injured area or ulcer (Pramahamsa, N. Semadi and Widiyana, 2017) so that it can speed up the wound healing process. A wound healing process can reduce the inflammatory response and prevent amputations that can reduce the quality of life of patients. Improving the degree of injury and wound characteristics after hyperbaric oxygen therapy can reduce pain and medical needs. In addition, a decrease in pain causes patients to have enough rest time to increase vitality at work.

Regarding the psychological domain, there is an effect of hyperbaric oxygen on quality of life. There were significant differences between the intervention group and the control group in the psychology domain from

the results of the Mann Whitney U Test, and the Wilcoxon signed rank test results stated that there were significant differences between the pre and post test scores in the intervention group. Respondents with diabetic foot ulcers experience a decrease in physical function which indirectly affects their psychological state. Respondents generally feel the emergence of feelings of anxiety, depression and frustration (Queen 2010).

Rahmat (2010) stated that individuals who suffer from DM with diabetic foot ulcers can cause other complications besides physical complications such as psychological complications in the form of anxiety. Long-term impact, patients will experience negative feelings towards him due to prolonged diabetic foot ulcer wounds and a long healing process. Thus, a fast-wound healing process can reduce patient's anxiety. Improving the quality of life along with expectations and certainty of improving the characteristics of the wound condition. The great hope of healing causes them to be motivated.

Increasing the value of quality of life can also be seen in the domain of social relations, based on the results of the Mann Whitney U Test there are significant differences between the intervention and control groups. Patients with diabetic foot ulcers will generally experience impaired self-image. The presence of ulcers in the body causes people with DM to feel fear in their social life. Most people with diabetic foot ulcers feel insecure in interacting socially because of their circumstances.

Along with the better degree of injury, the level of confidence in patients with diabetic foot ulcer will increase. A high level of self-confidence makes it easier for respondents to socialize with their environment. These results are supported by an increase in the value of the social relations domain in the intervention group based on the Wilcoxon signed rank test results.

Socializing with your family and closest friends can help reduce the level of depression. The presence of interpersonal support is very helpful to increase self-confidence related to the patient's ability to carry out self-care. Patients with good interpersonal support turned out to have a sense of security and comfort that will foster a sense of attention to themselves and increase motivation to carry out disease management (Faridah et al 2017). This is supported by the cultural characteristics of the Indonesian people who are socializing, familial, respectful, and respectful among others.

In the environmental domain, the results of hyperbaric oxygen influence the quality of life of the environmental domain. The Mann Whitney U Test showed a significant difference between the control group and the group that received hyperbaric oxygen. An increase in quality of life in the environmental domain was also seen in the intervention group, where the Wilcoxon Signed rank test results stated that there were significant differences between the pre and post test scores.

The results of research on the environmental domain are based on a person's personality, culture and environment that affect one's cognitive perception in interpreting their quality of life (Mabsusah 2016). Study conducted by Hilleson (2010) about environmental factors that affect quality of life such as caregiver satisfaction, attachment to the place, type and quality of available health services, and involvement of sufferers in the social environment improve their quality of life.

In this study showed that there was an effect of hyperbaric oxygen on improving the quality of life for patients with diabetic foot ulcers. This improvement in quality of life is in line with the improvement of wound conditions associated with one of the benefits of hyperbaric oxygen as a wound healing. Duzgun (2008) states that the use of hyperbaric oxygen in the treatment of diabetic foot ulcers has statistically increased the prevalence of ulcer healing. Hyperbaric oxygen also reduces the prevalence of amputation, and when amputation is needed, no amputation is localized proximal to the metatarsophalangeal joint. So that hyperbaric oxygen can be used as an adjuvant therapy to improve the quality of life for patients with diabetic foot ulcers.

## CONCLUSION

Giving hyperbaric oxygen to patients with diabetes mellitus with diabetic foot ulcers shows improvement in the degree and characteristics of the wound so that it can increase the four domains of quality of life. Hyperbaric oxygen reduces the pain and medical needs of patients with diabetic foot ulcers, this can reduce anxiety related to the condition experienced and improve interpersonal support and confidence. Hyperbaric oxygen as an adjuvant therapy in the wound healing process increases the congenital perception of patients with diabetic foot ulcers in interpreting their quality of life. Other research is expected to be able to be developed by further researchers with methods that are more objective in covering other identified aspects related to quality of life.

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